DOCUMENT RESUME

ED 276 446 IR 012 511

AUTHOR Miller, Richard B.
TITLE The Integration of Skills and Content.
PUB DATE Oct 86
NOTE 16p.; In: Thinking across the Disciplines. ISII 1986. Proceedings of the Annual Conference of the International Society for Individualized Instruction (15th, Atlanta, Georgia, October 9-11, 1986); see IR 012 493.
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Processes; Content Analysis; *Course Content; Diagnostic Tests; *Interdisciplinary Approach; *Skill Development; Skills; *Teaching Methods; Writing Skills
IDENTIFIERS *Content Area Teaching; *Thinking Skills

ABSTRACT

This paper argues that if thinking skills are to be integrated into the curriculum two needs must be addressed: (1) the manner of teaching content must be revised so that thinking skills are used and reinforced during the learning process, and (2) courses whose primary focus is the improvement of thinking skills must be offered. A comparison is made between thinking and writing skills to illustrate the use of content in skill instruction, and three possible approaches are described: the Content-Free Approach, the Diverse Content Approach, and the Uniform Content Approach. It is suggested that the Diverse Content Approach is the best for teaching thinking skills. An example of this approach is provided and ways to integrate skills and content are discussed. Since skill instruction with diverse content is labor intensive, two ways of limiting the demands on the instructor are suggested: (1) an analysis of the course to reveal the more relevant thinking skills for the instructor to focus on; and (2) diagnostic testing of students to identify the individual student needs to be addressed. The advantages of integrating content and thinking skills are discussed, as well as the importance of creating a databank of questions with diverse content that are based on common reasoning patterns for use in diagnostic testing of students. (DJR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED276446

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

The Integration of Skills and Content

Richard B. Miller

East Carolina University

IR012511

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Richard B.Miller

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ABSTRACT OF
"THE INTEGRATION OF SKILLS AND CONTENT"
by Richard Miller

Just as students who are expected to absorb content without the requisite thinking skills often fail; students who attempt to master reasoning skills without appropriate content also fail. There are three possible approachs to the use of content in skill instruction: the CONTENT-FREE APPROACH, THE DIVERSE CONTENT APPROACH, and the UNIFORM CONTENT APPROACH.In this paper I argue that the best approach is to integrate skill instruction with DIVERSE CONTENT.

Every decade there seems to be a renewed wave of concern about American education. In the wake of early Soviet space exploration there was a call for renewed emphasis on the quantitative disciplines. This brought us the "new Math." In the sixties we discovered that we were killing the creativity of our children and that we must in consequence either deschool or freeschool. In the seventies we discovered that Johnny can't read and we went "back to basics"--drill, rote memorizations, and discipline.

Each of these waves of concern have been followed by a period of reaction. The movement of the 80's is to improve the thinking skills of our students. Let us heed the warning of our recent history. There is the same potential for creating a huge amount of smoke and very little fire now as there was in the 60's and 70's. I fear that the end result may be that "thinking skills" will be defined so broadly as to encourage educators to merely redescribe their curricula and methods in the now fashionable jargon without making any significant changes. On the contrary I will argue that changes are necessary both in the curricula and in instructional methods.

The need for an overhaul of our educational system is apparant. Our students are not learning how to think as well as they might. For example, a study comparing Japanese and North Carolina students, grades 7 - 9, found that three times as many of the Japanese students (35% as compared to 10%) possessed formal reasoning skills.[1] Unless we are to conclude that the Japanese are genetically superior to North Carolinians(!), we

must suppose that either the home and/or school environment of the Japanese students was more favorable to the development of those skills. Nor are these skills unimportant. They correlate with success in most areas of the curriculum.[2]

On the importance of thinking skills virtually all are agreed. There are, however, deep differences about what we should do about it. These differences are often expressed, unfortunately, in these terms: Should we establish special courses to teach thinking skills, OR should we integrate skill instruction into ordinary content courses? Note that this is a classic fallacy--it is a false dilemma. There is no reason why we should not, and as I will argue, very good reason why we should do both. There needs to be an overhaul of our manner of teaching content so that thinking skills are used and reinforced during this process. There is also a need in our curriculum at present for courses whose primary focus is the improvement of thinking skill. Worse, the second horn of the dilemma is sometimes taken to mean that present curricula and methods are quite acceptable, that the problem, if any, is with poor teachers, that good teachers have taught reasoning skills all along.

The comparison of thinking skills and writing skills is instructive. The university curriculum quite properly requires that all students take composition courses taught by specialists in the instruction of writing. These composition courses are not "content-free," typically the students must read essays and write about them, but the emphasis of the course is on writing. The existence of these writing courses does not eliminate the need

for essay exams and papers being integral parts of other courses in the curriculum. Indeed, students will not learn to write well unless they are exposed to both types of instruction. I argue that we need to approach thinking skills the same way. There should be specialized "critical thinking" courses, as well as attention to thinking skills integrated into content courses. Just as writing across the curriculum SUPPLEMENTS composition courses, thinking across the curriculum SUPPLEMENTS applied logic courses.

In discussing the relation between content and skills we need to distinguish between three, not two, approachs to the use of content in the examples which are chosen to illustrate particular thinking skills. The three possible approaches are: CONTENT-FREE, UNIFORM CONTENT, and DIVERSE CONTENT. CONTENT-FREE skill instruction is perfectly abstract. In CONTENT-FREE instruction, and pure symbolic logic is a good example of this approach, a particular form of thinking is described abstracted from all content. Pure abstract thought is intimidatingly remote from normal thought processes and generates a great deal of resistence on the part of average students, though it is probably the most efficient way to impart these skills to high achievers. It is little wonder that many instructors believe that thinking skill instruction will work better with some content. But failure to distinguish between UNIFORM CONTENT and DIVERSE CONTENT has lead some to conclude that skill instruction can use the same content normally presented in some particular subject. On the contrary I would like to suggest that we need to use DIVERSE not UNIFORM CONTENT to teach thinking skills.

Instruction in the content of specific disciplines requires the possession of thinking skills, skills which are intimately tied to mastery of language. To illustrate this dependency I need only point out that cognitive psychologists have long known that people store information as propositions rather than as sentences. For example, students listening to a lecture are very unlikely to remember the actual sentences that were uttered. Instead, these sentences are interpreted into propositions and it is the propositional content that is stored. This interpetation of sentences into propositions is automatic. But what if a student systematically encodes the wrong propositions when listening to sentences? Obviously, communication breaks down. Data indicate that average college students do encode the wrong propositions even with remarkably simple sentences. Practically half of a random sample of college freshmen misinterpret sentences using the word "only."[3] Significant minorities interpret statements of class inclusion are asserting class equivalence. Many students misunderstand the word "unless." Imagine giving a lecture and being forced to avoid the use of words like "only," "unless," "if," "all," etc. It is clear that content instruction suffers for the lack of these skills.

It has seemed plausible to many that just as instruction for content requires skills, instruction for skills also requires content. Those who have argued this position have not, however, made the distinction between UNIFORM CONTENT and DIVERSE CONTENT. I argue that it is the latter and not the former which will best promote the acquisition of truly general thinking skills, i.e.

skills which transfer to a wide variety of content areas. Bob Marzano and the McREL Program seeks to add skill instruction to ordinary content courses. John McPeck argues that traditional content courses are both necessary and sufficient because there are no general thinking skills.[4] Both are convinced that specialized courses in thinking skills are not desirable on the grounds that content is required. I agree that some content is required for the optimal instruction of average students (I persist in thinking that for the best students CONTENT FREE instruction is the most efficient.) But neither Marzano nor McPeck seems to be aware of the distinction between UNIFORM CONTENT and DIVERSE CONTENT. It is the former not the latter which they would rely on. I argue that it is the latter and not the former that we should incorporate into courses.

An example of DIVERSE CONTENT would perhaps be helpful at this point. As I mentioned above nearly half of all college freshman have trouble understanding sentences of the form: Only A's are B's. They tend to interpret such statements as asserting that A is a subset of B instead of the converse: B is a subset of A. For the purposes of both testing and instruction I use examples of statements of this form with DIVERSE CONTENT. Three examples are: Only Representationalists are Impressionists (content: Art History), Only Materialists are Functionalists (content: Philosophy), and Only bilaterally symmetric species are chordates (content: Biology).

We ought to be aiming at providing our students with truly general thinking skills. Formal logic is the study of patterns of reasoning that are content neutral, that is, the reliability

of the argument is independent of its content. To put this point another way, a good argument form is good no matter what subject matter is used to fill the form. Instructing students in the abstract forms themselves, devoid as they are of all content, has its problems. On the other hand, getting students to grasp the underlying form by presenting multiple instances of the form filled in with different contents is a pedagogically successful strategy. Not only that, students who come to grasp the patterns in this way see at once that the pattern is applicable across the curriculum. This is one powerful way of fighting the tendency which students have to compartmentalize their knowledge. By instructing them in this way we are actually helping them to see connections between the disciplines.

Thus, as I see it, the distinction between content and skills courses is merely one of emphasis. Both need to make use of DIVERSE CONTENT. A typical content course in a discipline will present content which is for the most part uniform. Diversity will be introduced only when some particular thinking skill is being highlighted. In a skills course, on the other hand, skills are always being highlighted so the content is incidental.

I am in full agreement with those who, like Bob Marzano, seek to integrate thinking skills into the usual content courses. Merely adding specialized courses in thinking will not do the trick. But this does not mean that there is no need for specialized courses, any more than Writing Across the Curriculum obviates the need for English Composition.

The current curriculum does not succeed in developing thinking skills, and this will not change merely by making instructors cognizant of the need. Teaching thinking skills is more difficult than it seems. To expect instructors to successfully inculcate these skills as a by-product of normal instruction is probably expecting too much. However, to expect their efforts to succeed at supplementing and reinforcing lessons learned in a specialized course devoted to thinking skills is quite reasonable. The advantage of such specialized courses is that the instructor is able to specialize in this difficult field and over the years builds up a body of experience and course materials which he has found effective. Also concentrating on these skills in a single class allows instruction in one skill to reinforce instruction in others. Thinking skills are interconnected and devoting primary attention to these skills in one semester permits a body of skills to build upon each other in a way that is unlikely when skills are taught isolated from each other.

Instructors who are sensitive to the need to integrate skill instruction into content courses must become aware of the requirements of effective instruction of skills. The main difference between skill and content from a pedagogical point of view is that skill is inherently general while content is specific. From this it follows that successful instruction for skills requires 1. repetition 2. active participation 3. DIVERSE CONTENT. It is the third of these points which is most likely to be overlooked by the instructor in a course primarily devoted to a specific content. A good history professor may attempt to get

her students to grasp a thinking skill, e.g. the evaluation of causal hypotheses, and choose several examples to illustrate this skill. Unless the teacher is sensitive to the requirement of content diversity she will probably choose three historical examples--after all, that is her field of expertise. In doing so the skill will not be taught in its true generality. At best the students will see that this is a skill that can be applied to other cases in history. They will not even attempt to apply it in engineering, or marketing, or library science, or psychology.

Skill instruction with DIVERSE CONTENT is extremely labor intensive. Not only must the instructor use multiple examples of each skill, which is itself time consuming, she must also select these examples from a variety of disciplines. This means that time and effort must go into selecting examples from outside the instructor's specialty. Something must be done to limit the demands on the instructor in order to keep the task within manageable bounds. I have two practical suggestions: 1) an analysis of the course should reveal that certain thinking skills are more relevant to that particular course than other skills, the instructor should focus on these. 2) The instructor needs to do some diagnostic testing of his students. There is no need to instruct every student in every skill. Only the specific individual weaknesses of students need to be addressed.[5]

DIVERSE CONTENT should also be integrated into skills courses. In these courses the temptation is to rely on CONTENT FREE explanations rather than on UNIFORM CONTENT. CONTENT FREE instruction in skills can take the form of uninterpreted symbols

(p v q, -p / q), or in nonsense words (All toves are slithy, Howard is a tove. Therefore, Howard is slithy), or in contextless use of pronouns and demonstratives (If this, then that. This. Therefore, that.) We all resort to CONTENT FREE explanations from time to time, though they are extremely difficult for average students to understand.

In teaching thinking skills to average students in a course where this is the primary focus I have integrated content, in the form of both terminology and information, from diverse fields such as biology, accounting, theology, politics, and history. This has numerous advantages: 1) It avoids the contamination of background knowledge and beliefs. In using questions with content one can never be sure whether or not the student is answering on the basis of logic or if they are making a guess based on their background beliefs. If unfamiliar terminology is used it practically eliminates the possibility of such contaminents. 2) It improves student motivation. It has virtually eliminated the recurrent question: what's all this stuff for? 3) It actually teachs some content. 4) it works with rather than against the normal tendency to interpret sentences semantically. 5) it gradually weans the student from a dependency on semantic interpretation and allows then to become aware of syntax in a natural fashion.

As I have indicated above, the optimal approach for the instruction of thinking skills is one which utilizes DIVERSE CONTENT. This is labor intensive even in content courses, where skill development is incidental. It becomes a very heavy burden

in courses which are primarily devoted to skills. In a skills course one must draw on content outside one's area of expertise not once or twice a week, but many times in each class meeting. Any labor saving device is welcome under such circumstances.

I have found it necessary both for research and for teaching purposes to construct sets of questions with DIVERSE CONTENT based of common reasoning patterns. I have constructed three or more questions for each of over 100 identifiable skills. I have put these questions into a database which allows me to construct tests quickly and easily according to specific designations.

Tests of thinking skills need to be constructed very differently depending on whether the purpose is to test the skill level of individual students or if the purpose is to conduct research into the individuation of skills.[6] For both these purposes I have found need of an extremely large database of questions with DIVERSE CONTENT. For research purposes I use all the questions of a particular type. If there are statistically significant correlations among the answers given for these questions having a common logical pattern but DIVERSE CONTENT then I conclude that I have isolated a real thinking skill. Work of this kind is necessary to build up an empirically verifed taxonomy of thinking skills. The taxonomies of thinking skills which lie behind the major tests currently on the market have been validated only by analysis of the questions on those tests. Since these tests are not designed for research into the individuation of thinking skills but rather for evaluating individual students the results are far from decisive. We need tests which are designed specifically for that job. Such tests

must contain several questions which purport to test the same skill. Tests of individuals on the other hand need to cover as many skills as possible in order to get a valid sampling of the extent of the students mastery of the universe of skills.

A databank of questions with DIVERSE CONTENT is also necessary for instruction. Having this database at my disposal allows me to engage in extensive diagnostic testing of students. Before attempting to instruct a group of students in a particular set of skills I pre-test them to determine individual strengths and weaknesses. Students self-diagnose based on the pre-test and then focus their study time entirely on those skills which the test indicates that they lack. This eliminates the need to present material to students which they already possess and saves the instructor and the students valuable time and energy. Subsequent tests can be pulled from the databank using entirely different questions which test exactly the same skills. Students know that they will see questions of the same form with different content so that they realize that they must be prepared to apply the skill to wholly new content. Thus, transference of these skills is a built in condition of success. This method has allowed me to successfully demand mastery level learning with required transference of the skill and has enabled me to cover the same amount of material as similar courses at other universities. I have not had to cut back on the amount of material covered despite switching to mastery level learning.

Early results have also indicated that success in essay writing is highly correlated with the degree of success that a student achieves on mastering these thinking skills.[7] Much

work remains to be done, particularly in the construction of an empirically validated taxonomy of reasoning skills. These skills need to be individuated and then the relationships among the skills explored.

Notes

[1] A detailed report of this study conducted by Floyd Mattheis, William Spooner, and Charles Coble may be obtained from Prof. Mattheis, Director, Mathematics/Science Education Network Center, East Carolina University, Greenville, NC 27834.

[2] Lawson, Anton E., "A Review of Research on Formal Reasoning and Science Teaching." Journal of Research in Science Teaching, vol. 22, no. 7, 1985, pp. 569-617. Cited by Mattheis, Spooner and Coble, op. cit.

[3] A extensive study of the reasoning skills of entering college freshmen was conducted using the New Jersey Test of Reasoning Skills. This study is available through the Institute for the Advancement of Philosophy for Children, Montclair State College, Upper Montclair, NJ 07043. I replicated this study on a smaller scale using second semester freshmen at East Carolina University in North Carolina and my results were essentially the same.

[4] John McPeck Critical Thinking and Education (New York, St. Martin's Press, 1981) and Robert Marzano Thinking Skills (Aurora, Colorado; Mid-continent Regional Educational Laboratory, 1985)

[5] Richard B. Miller, "Diagnostic Testing and Individualized Instruction of Reasoning Skills" ISII Conference, 1985, available through ERIC.

[6] This issue is discussed in more detail in Richard B. Miller, "Toward an Empirical Definition of the Thinking Skills," Informal Logic forthcoming January 1987.

[7] Craig Lehman, "Correlating Logical Skills with Educational Background and Progress" unpublished study.